

## CA#3 Study Guide-Spring 2018

- What is the mass in grams of 6.52 moles of  $C_8H_{16}$ ?
- How many moles of copper are in  $6.25 \times 10^{20}$  atoms of copper?
- How many moles are in 625 g of magnesium hydroxide?
- $3.25 \times 10^{24}$  atoms of carbon would be how many moles of carbon?
- How many molecules are in 12.0 grams of ethane?
- Calculate the number of atoms in 28.0 grams of silver.
- What is the molar mass of barium nitrate?
- A molecule has an empirical formula of  $PH_3$ . Which of the following would be a possible molecular formula? A)  $PH_4$  B)  $P_2H_3$  C)  $P_2H_5$  D)  $P_2H_6$
- What is the percent chromium in magnesium chromate?
- A compound's empirical formula is  $C_2H_5$  and the molar mass of the compound is 87.21 g/mole. Determine the molecular formula of the compound.
- A compound contains 18.11 g carbon and 481.9 g bromine. What is the empirical formula of the compound?
- Calculate the percent composition of copper (II) sulfate.
- A compound contains 54.5 % carbon, 13.6 % hydrogen, and 31.8 % nitrogen. Calculate the empirical formula.
- Which of the following compounds have the same empirical formula?  
A)  $CO_2$  and  $SO_2$  C)  $C_8H_{20}$  and  $C_{30}H_{12}$   
B)  $N_2O_5$  and  $N_3O_7$  D)  $C_7H_{14}$  and  $C_{12}H_{24}$
- Using the reaction below, calculate the grams of  $PH_3$  are produced when 4.6 g of hydrogen reacts?  
Balance the reaction first!  
 $P_4 + H_2 \rightarrow PH_3$
- Using the reaction below, calculate the number of moles of iron that would be produced when 0.50 moles of aluminum react. Balance the reaction first!  
 $Al + FeO \rightarrow Fe + Al_2O_3$
- Using the reaction in #16, calculate the number of moles of aluminum oxide produced when 52.0 g of  $FeO$  react.
- Using the reaction below, calculate the grams of phosphoric acid produced when 12.0 moles of water react. Balance the reaction first!  
 $P_4O_{10} + H_2O \rightarrow H_3PO_4$
- Using the reaction below, calculate the grams of water needed to produce 15.5 moles of hydrogen. Balance the reaction first!  
 $Be + H_2O \rightarrow Be(OH)_2 + H_2$
- Predict products and balance the following reaction.  
 $KNO_3(aq) + MgCl_2(aq) \rightarrow ??$
- Predict products and balance the following reaction.  
 $K_2CO_3(aq) + MgBr_2(aq) \rightarrow ??$
- Write the equation for the reaction between potassium phosphate and zinc (II) nitrate.
- For a reaction, the theoretical yield is calculated to be 65.0 g  $N_2$ . When a student carries out the experiment, they collect 52.5 g  $N_2$ . Determine the percent yield collected by the student.
- When 10.5 grams of  $Pb(NO_3)_2$  is heated in a decomposition reaction, the actual yield of  $PbO$  collected is 5.9 grams. What is the percent yield? Balance the reaction first!  
 $Pb(NO_3)_2 \rightarrow PbO + NO_2 + O_2$

25. A) How many grams of copper can be obtained when 81 g of Al reacts with 479 g of CuSO<sub>4</sub>? Balance!  
 B) What is the limiting reactant?  
 C) What is the excess reactant?  

$$\text{Al} + \text{CuSO}_4 \rightarrow \text{Al}_2(\text{SO}_4)_3 + \text{Cu}$$

## Reactions Review

26. What are the 7 diatomic molecules?  
 27. Why must we balance chemical equations?  
 28. What happens to the oxidation number of a substance that is reduced?  
 29. The movement of electrons occurs in which type(s) of chemical reactions?  
 30. What are some observations that indicate a chemical reaction has occurred?

31. Predict products, balance and identify the type of reaction:

If no reaction occurs for a single replacement reaction, write "NR" and identify the type of reaction.

Type:

- a. Sodium bromide and calcium hydroxide are mixed .....
- b. C<sub>5</sub>H<sub>9</sub>O is mixed with oxygen gas .....
- c. Lead and phosphoric acid are mixed .....
- d. Iron (III) bromide and sodium are mixed .....
- e. C<sub>2</sub>H<sub>4</sub>O<sub>2</sub> and oxygen gas are mixed .....
- f. Manganese (IV) oxide and tin (IV) hydroxide are mixed ....
- g. Hydrochloric acid and magnesium are mixed ....
- h. Potassium chlorate and ammonium sulfate are mixed ....
- i. Sodium carbonate and cobalt (I) nitrate are mixed ....
- j. Manganese (II) fluoride and bromine are mixed .....

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32. Predict products and determine the substance being oxidized and reduced in the following reactions. Assume all reactions occur.

- a. \_\_\_\_\_ Rb + \_\_\_\_\_ ZnS →
- b. \_\_\_\_\_ Ca + \_\_\_\_\_ F<sub>2</sub> →
- c. \_\_\_\_\_ SrCl<sub>2</sub> →

Answers

1. 732 g
2. 0.00104 moles
3. 10.7 moles
4. 5.40 moles
5.  $2.40 \times 10^{23}$  molecules
6.  $1.56 \times 10^{23}$  atoms
7. 261.36 g/mole
8. D
9. 37.06 %
10.  $C_6H_{15}$
11.  $CBr_4$
12. 39.81 % Cu, 20.09 % S, 40.10 % O
13.  $C_2H_6N$
14. D
15. 52 g
16. 0.75 moles
17. 0.241 moles
18. 784 g
19. 559 g
20. Products: KCl and  $Mg(NO_3)_2$ .
21. Products:  $MgCO_3$  and KBr.
22. NOT Balanced:  $K_3PO_4 + Zn(NO_3)_2 \rightarrow Zn_3(PO_4)_2 + KNO_3$
23. 80.8 %
24. 83 %
25. 191 g Cu, LR =  $CuSO_4$ , XS reactant = Al

# Reactions Review

31.



double replacement



combustion



single replacement



single replacement



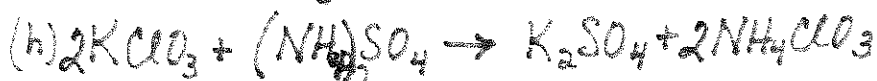
combustion



double replacement



single replacement



double replacement

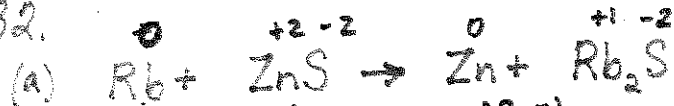


double replacement



single replacement

32.



Zn = reduced Rb = oxidized



F = reduced Ca = oxidized



Sr = reduced Cl = oxidized



27. Matter cannot be created nor destroyed. Coefficients show how the equation represents this.

28. The oxidation # of a substance that is reduced, gets smaller.

29. Movement of electrons occur in

30. Evidence of chemical reactions: gas released, precipitate formed, temperature change

# CA#3 Study Guide

$$1. \frac{6.52 \text{ mol } C_8H_{16} | 112.24 \text{ g } C_8H_{16}}{1 \text{ mol } C_8H_{16}} = 732 \text{ g } C_8H_{16}$$

$$2. \frac{6.25 \times 10^{20} \text{ atom Cu} | 1 \text{ mol Cu}}{6.022 \times 10^{23} \text{ atom Cu}} = .00104 \text{ mol Cu}$$

$$3. \frac{6.25 \text{ g } Mg(OH)_2 | 1 \text{ mol } Mg(OH)_2}{58.33 \text{ g } Mg(OH)_2} = 10.7 \text{ mol } Mg(OH)_2$$

$$4. \frac{3.25 \times 10^{24} \text{ atom C} | 1 \text{ mol C}}{6.022 \times 10^{23} \text{ atom C}} = 5.40 \text{ mol C}$$

$$5. \frac{12.0 \text{ g } C_2H_6 | 1 \text{ mol } C_2H_6 | 6.022 \times 10^{23} \text{ mole } C_2H_6}{30.08 \text{ g } C_2H_6 | 1 \text{ mol } C_2H_6} = 2.40 \times 10^{23} \text{ mole } C_2H_6$$

$$6. \frac{28.0 \text{ g } Ag | 1 \text{ mol } Ag | 6.022 \times 10^{23} \text{ atom } Ag}{107.87 \text{ g } Ag | 1 \text{ mol } Ag} = 1.56 \times 10^{23} \text{ atom } Ag$$

$$7. \begin{array}{l} Ba(NO_3)_2 \\ Ba = 1 \times 137.33 = 137.33 \\ N = 2 \times 14.01 = 28.02 \\ O = 6 \times 16.00 = 96.00 \\ \hline 261.35 \text{ g/mol} \end{array}$$

$$8. \text{EF} = PH_3 \quad \text{MF} = P_2H_6$$

$$9. \begin{array}{l} MgCrO_4 \\ Mg = 1 \times 24.31 = 24.31 \\ Cr = 1 \times 52.00 = 52.00 \\ O = 4 \times 16.00 = 64.00 \\ \hline 140.31 \text{ g/mol} \end{array} \quad \begin{array}{l} Mg = \frac{24.31}{140.31} \times 100 = 17.33\% \\ Cr = \frac{52.00}{140.31} \times 100 = 37.06\% \\ O = \frac{64.00}{140.31} \times 100 = 45.61\% \end{array}$$

10.  $C_2H_5$   $C = 2 \times 12.01 = 24.02$   
 $H = 5 \times 1.01 = 5.05$   
 $\frac{24.02 + 5.05}{29.07 \text{ g/mol}}$

MF =  $\frac{87.21 \text{ g/mol}}{29.07 \text{ g/mol}} = 3 (C_2H_5)$   
 $C_6H_{15}$

11.  $\frac{18.11 \text{ g C}}{12.01 \text{ g C}} \Big| \frac{1 \text{ mol C}}{12.01 \text{ g C}} = \frac{1.508}{1.508} = 1$



$\frac{481.9 \text{ g Br}}{79.90 \text{ g Br}} \Big| \frac{1 \text{ mol Br}}{79.90 \text{ g Br}} = \frac{6.031}{1.508} = 4$

2.  $CuSO_4$   $Cu = 1 \times 63.55 = 63.55$   
 $S = 1 \times 32.07 = 32.07$   
 $O = 4 \times 16.00 = 64.00$   
 $\frac{63.55 + 32.07 + 64.00}{159.62 \text{ g/mol}}$

$Cu = \frac{63.55}{159.62} \times 100 = 39.81\%$

$S = \frac{32.07}{159.62} \times 100 = 20.09\%$

$O = \frac{64.00}{159.62} \times 100 = 40.10\%$

13.  $\frac{54.5 \text{ g C}}{12.01 \text{ g C}} \Big| \frac{1 \text{ mol C}}{12.01 \text{ g C}} = \frac{4.538}{2.270} = 2$



$\frac{13.6 \text{ g H}}{1.01 \text{ g H}} \Big| \frac{1 \text{ mol H}}{1.01 \text{ g H}} = \frac{13.47}{2.270} = 6$

$\frac{31.8 \text{ g N}}{14.01 \text{ g N}} \Big| \frac{1 \text{ mol N}}{14.01 \text{ g N}} = \frac{2.270}{2.270} = 1$

14.  $C_7H_{14}$  and  $C_{12}H_{24}$